CLAIMS

What is claimed is:

1. A RF-lightwave modulator comprising:

a broken loop resonator, the broken loop resonator having a gap therein;

an input providing an input signal to drive the broken loop resonator, the broken loop resonator generating an RF output signal in response thereof; and

an optical modulator connected across the gap receiving the RF output signal, the optical modulator modulating a lightwave with the RF output signal to generate a RF-modulated lightwave.

2. The RF-lightwave modulator of claim 1, wherein the optical modulator comprises a modulator selected from the group consisting of electroabsorption modulators, waveguide phase modulators, and electro-optic modulators.

3. The RF-lightwave modulator of claim 1, wherein the input comprises a member selected from the group consisting of RF transmission line and photodetectors.

4. The RF-lightwave modulator of claim 1, wherein the broken loop resonator is constructed from RF transmission line.

5. The RF-lightwave modulator of claim 3, wherein the input signal is a RF input signal, and wherein the input receives and provides the RF input signal when the input is constructed from RF transmission line.

6. The RF-lightwave modulator of claim 3, wherein the input signal is a RF input signal, and wherein the input receives a lightwave input signal comprising multiple frequencies when the input comprises the photodetector, the photodetector converting the lightwave input signal into the RF input signal.

7. The RF-lightwave modulator of claim 1, wherein the broken loop resonator comprises ends which define the gap, the ends providing the RF output signal for modulating the optical modulator, wherein the optical modulator is coupled to the ends with wires.

8. The RF-lightwave modulator of claim 1, wherein the broken loop resonator comprises ends which define the gap, the ends serving as electrodes for the optical modulator, wherein the optical modulator is coupled directly to the ends.

9. The RF-lightwave modulator of claim 1, further comprising a bias control circuit coupled to the optical modulator for adjusting the passband of the RF-modulated lightwave.

10. The RF-lightwave modulator of claim 9, further comprising a variable capacitor coupled to the bias control circuit, optical modulator, and an edge of the broken loop resonator defining a portion of the gap, the variable capacitor adjusting the passband and center frequency of the RF-modulated lightwave.

11. The RF-lightwave modulator of claim 1, wherein the intensity of the RF output signal in the broken loop resonator is a maximum across the gap.

12. The RF-lightwave modulator of claim 1, wherein the input, broken loop resonator, and optical modulator are disposed on a substrate.

13. The RF-lightwave modulator of claim 1, wherein the optical modulator receives the lightwave via optical fiber.

14. The RF-lightwave modulator of claim 6, wherein the modulator is a RF-lightwave repeater.

15. The RF-lightwave modulator of claim 6, wherein the modulator is an optical-wavelength-converting repeater.

16. The RF-lightwave modulator of claim 1, further comprising:

a second broken loop resonator nested within the broken loop resonator, the second broken loop resonator sharing the gap with the broken loop resonator; and the broken loop resonator and second broken loop resonator having different overall lengths; and

at least one switch for activating the broken loop resonator or second broken loop resonator, wherein the input signal drives the activated broken loop resonator, and wherein the activated broken loop resonator generates the RF output signal in response thereof.

17. The RF-lightwave modulator of claim 16, wherein the optical modulator comprises a modulator selected from the group consisting of electroabsorption modulators, waveguide phase modulators, and electro-optic modulators.

18. The RF-lightwave modulator of claim 16, wherein the input comprises a member selected from the group consisting of RF transmission line and photodetectors.

19. The RF-lightwave modulator of claim 16, wherein the first and second broken loop resonators are constructed from RF transmission line.

20. The RF-lightwave modulator of claim 18, wherein the input signal is a RF input signal, and wherein the input receives and provides the RF input signal when the input is constructed from RF transmission line.

21. The RF-lightwave modulator of claim 18, wherein the input signal is a RF input signal, and wherein the input receives a lightwave input signal comprising multiple frequencies when the input comprises the photodetector, the photodetector converting the lightwave input signal into the RF input signal.

22. The RF-lightwave modulator of claim 16, wherein the broken loop resonator comprises ends which define the gap, the ends providing the RF output signal for modulating the optical modulator, wherein the optical modulator is coupled to the ends with wires.

23. The RF-lightwave modulator of claim 16, wherein the broken loop resonator comprises ends which define the gap, the ends serving as electrodes for the optical modulator, wherein the optical modulator is coupled directly to the ends.

24. The RF-lightwave modulator of claim 16, further comprising a bias control circuit coupled to the optical modulator for adjusting the passband of the RF-modulated lightwave.

25. The RF-lightwave modulator of claim 24, further comprising a variable capacitor coupled to the bias control circuit, optical modulator, and an edge of the broken loop resonator defining a portion of the gap, the variable capacitor adjusting the passband and center frequency of the RF-modulated lightwave.

26. The RF-lightwave modulator of claim 16, wherein the intensity of the RF output signal in the broken loop resonator is a maximum across the gap.

27. The RF-lightwave modulator of claim 16, wherein the input, broken loop resonator, and optical modulator are disposed on a substrate.

28. The RF-lightwave modulator of claim 16, wherein the optical modulator receives the lightwave via optical fiber.

29. The RF-lightwave modulator of claim 16, wherein the at least one switch is a RF MEMS switch.

30. A RF-lightwave modulator comprising:

means for coupling an input signal into a broken loop resonator having a gap therein, the broken loop resonator producing a RF output signal in response thereof ; and

means for modulating a lightwave with the RF output signal to produce a RF-modulated lightwave, wherein said means for modulating is connected across the gap.

31. The RF-lightwave modulator of claim 30, wherein the means for modulating comprises an optical modulator selected from the group consisting of electroabsorption modulators, waveguide phase modulators, and electro-optic modulators.

32. The RF-lightwave modulator of claim 30, wherein the means for coupling comprises a member selected from the group consisting of RF transmission line and photodetectors.

33. The RF-lightwave modulator of claim 30, wherein the broken loop resonator is constructed from RF transmission line.

34. The RF-lightwave modulator of claim 32, wherein the input signal is a RF input signal, and wherein the input receives and provides the RF input signal when the means for coupling comprises RF transmission line.

35. The RF-lightwave modulator of claim 32, wherein the input signal is a RF input signal, and wherein the means for coupling receives a lightwave input signal comprising multiple frequencies when the means for coupling comprises the photodetector, the photodetector converting the lightwave input signal into the RF input signal.

36. The RF-lightwave modulator of claim 30, wherein the means for modulating comprises ends which define the gap, the ends providing the RF output signal for modulating the optical modulator, wherein the means for modulating is coupled to the ends with wires.

37. The RF-lightwave modulator of claim 30, wherein the means for modulating comprises ends which define the gap, the ends serving as electrodes for the means for modulating, wherein the means for modulating is coupled directly to the ends.

38. The RF-lightwave modulator of claim 30, further comprising a bias control circuit coupled to the means for modulating for adjusting the passband of the RF-modulated lightwave.

39. The RF-lightwave modulator of claim 38, further comprising a variable capacitor coupled to the bias control circuit, the means for modulating, and an edge of the broken loop resonator defining a portion of the gap, the variable capacitor adjusting the passband and center frequency of the RF-modulated lightwave.

40. The RF-lightwave modulator of claim 30, wherein the intensity of the RF output signal in the broken loop resonator is a maximum across the gap.

41. The RF-lightwave modulator of claim 30, wherein the means for coupling, broken loop resonator, and the means for modulating are disposed on a substrate.

42. The RF-lightwave modulator of claim 30, wherein the means for modulating receives the lightwave via optical fiber.

43. The RF-lightwave modulator of claim 35, wherein the modulator is a RF-lightwave repeater.

44. The RF-lightwave modulator of claim 35, wherein the modulator is an optical-wavelength-converting repeater.

45. A RF-lightwave modulator for use in a photonic oscillator comprising:

a broken loop resonator, the broken loop resonator having a gap therein;

a first photodetector receiving a first RF modulated lightwave, a second photodetector receiving a delayed second RF modulated lightwave, the first and second photodetectors converting the first and second RF modulated lightwave into first and second RF input signals to drive the broken loop resonator, the broken loop resonator generating an RF output signal in response thereof;

an optical modulator connected across the gap receiving the RF output signal, the optical modulator modulating a lightwave with the RF output signal to generate a RF modulated lightwave output; and

an optical splitter receiving the RF modulated lightwave output and providing the first and second RF modulated lightwave inputs to the first and second inputs.

46. The modulator of claim 45, wherein the optical modulator comprises a modulator selected from the group consisting of electroabsorption modulators, waveguide phase modulators, and electro-optic modulators.

47. The RF-lightwave modulator of claim 45, wherein the broken loop resonator is constructed from RF transmission line.

48. The RF-lightwave modulator of claim 45, wherein the broken loop resonator comprises ends which define the gap, the ends providing the RF output signal for

modulating the optical modulator, wherein the optical modulator is coupled to the ends with wires.

49. The RF-lightwave modulator of claim 45, wherein the broken loop resonator comprises ends which define the gap, the ends serving as electrodes for the optical modulator, wherein the optical modulator is coupled directly to the ends.

50. The RF-lightwave modulator of claim 45, further comprising a bias control circuit coupled to the optical modulator for adjusting the passband of the RF-modulated lightwave.

51. The RF-lightwave modulator of claim 50, further comprising a variable capacitor coupled to the bias control circuit, optical modulator, and an edge of the broken loop resonator defining a portion of the gap, the variable capacitor adjusting the passband and center frequency of the RF-modulated lightwave.

52. The RF-lightwave modulator of claim 45, wherein the intensity of the RF output signal in the broken loop resonator is a maximum across the gap.

53. The RF-lightwave modulator of claim 45, wherein the first and second input lines, broken loop resonator, and optical modulator are disposed on a substrate.

54. The RF-lightwave modulator of claim 45, wherein the optical modulator receives the lightwave via optical fiber.

55. A method for generating a RF-modulated lightwave comprising the steps of:

driving a broken loop resonator having a gap therein with an RF input signal, the broken loop resonator generating an RF output signal in response thereof; and

modulating a lightwave with the RF output signal to generate the RF-modulated lightwave, the RF output signal being taken from the broken loop resonator across the gap.

56. The method of claim 55 further comprising the step of adjusting the intensity or wavelength of the lightwave to adjust the passband of the RF-modulated lightwave.

57. The method of claim 55, further comprising the step of adjusting the impedance of the gap to adjust the passband and center frequency of the RF-modulated lightwave.

58. The method of claim 55, further comprising the step of adjusting the thickness or attenuation of the broken loop resonator to adjust the ratio of RF to DC components in the RF-modulated lightwave.